To all whom it may concern:

Be it known that I, FREDERICK M. FURBER, a citizen of the United States, residing at Revere, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Machines and Methods Applicable in the Cutting of Sheet Material, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to the cutting of sheet material and more particularly to the cutting of blanks from sheet material. While the illustrative machine which may be used in the practice of the novel method herein set forth is designed to cut heel lifts from leatherboard, the invention is not limited to such use.

In cutting blanks from sheet material according to methods heretofore employed, the sheet material is fed to cutting mechanism and blanks cut therefrom, with the accompanying production of waste or scrap material which necessitates the provision of special mechanism for removing the scrap or waste material from the field of cutting operations. The mechanism for removing the waste or scrap material has commonly comprised stripper mechanism for removing the scrap from the die or dies, together with either auxiliary feeding means for the scrap or some form of mechanism for scraping or brushing the waste material from the support in the neighborhood of the die or dies. Besides necessitating a certain complexity in the construction of cutting machines in general, the presence of scrap material has lessened markedly the efficiency of many types of cutting machines because of its presence in the machine as scrap material after cutting operations, and also because of its presence during the actual cutting operation. This last-mentioned factor is especially noticeable in machines in which dies are used as the cutting means. In these machines the sheet material surrounds the dies as the latter enter the material, produces a marked frictional drag on the dies, and is moved laterally, oftentimes under great compression, since the dies have appreciable thickness, so that the interaction of material and dies is such as to limit the number of sheets of material which can be cut at one operation.

It is an object of the present invention so to provide for cutting blanks that, at each operation, a theoretically unlimited number of sheets of material may be presented to and acted upon by a cutting member such as a die, the number of sheets to be cut at each operation depending only upon the size of the machine as determined by practical considerations and the conditions of factory use.

In one aspect the invention may be said to comprise means for insuring the removal of scrap from the machine in such a way as to provide absolutely against interference with the cutting operations. As herein exemplified, the sections of sheet material approximate in size the size of the blanks to be cut therefrom, novel means being provided for feeding a plurality of sections in sets and presenting them simultaneously to the cutting means.

In another aspect the invention comprises a method of cutting stock, such as sheet material, into blanks in such a way that a theoretically unlimited number of sheets in stacked relation may be cut into blanks in succession during continuous relative movement in mass toward and upon the cutting edge of a die.

A further object of the invention is to devise a method of cutting sheet material into blanks in the practice of which sheets will be cut with the greatest ease and rapidity and therefore most economically, and in the practical application of which a machine may be made to cut through a mass of sheets when furnished with no more power than is necessary to cut through one sheet.

Other objects and advantages of the invention will be apparent from the following description, when taken in connection with the accompanying drawings, and will be pointed out in the appended claims.

In the drawings:

Fig. 1 is a perspective view of an illustrative embodiment of my invention:

Fig. 2 is a view in perspective of the die and of the scrap removing mechanism:

Fig. 3 is a detail view, partly in section, illustrating the feeding and cutting of the sections of material; and

Fig. 4 is a plan view of a section of sheet
material after a cutting operation, indicating a step in the disposal of the scrap material.

In the illustrated machine, the cutting means for sheet material comprises a die 5 and a cutting block or platen 8 arranged for relative reciprocation to force the material on to the die. While either the die or cutting block may be made the movable member, in the present instance the die is stationarily supported in a frame 10 which carries also a table or support 12 for the sheet feeding mechanism which will be hereinafter described in detail. Mounted on an extension 14 of the frame of the machine is a guideway 16 for a plunger 18, which carries at the lower end thereof the cutting block 8. The operating means for the plunger is shown as comprising a link 20 connected pivotally to the bell-crank 22 at the forward end of the main shaft 24, though any other well-known mechanism may obviously be used to effect reciprocation of the plunger.

Mounted above one end of the support or table 12 is a magazine 26 for receiving the sheet material in sections which correspond approximately to the size of the heel lift or other blank to be cut therefrom. Preferably, one side of the magazine is open at 28 from top to bottom to facilitate the introduction of the sheet material, and the side adjacent the cutting means is provided with an opening the full width of the magazine, through which a plurality of sections may be pushed in feeding the same from the magazine into position above the die. This latter opening (see Fig. 3) may be regulated as to size and particularly as to the height of the opening as occasion may require, it being obvious that the sheets of material may vary slightly in thickness. The means for thus varying the height of the opening may comprise a plate 30 slidably mounted in guideways 32 and adjustable by means of a screw-threaded member 34. The members 32 which operate as guideways serve also as supports for the magazine 26 since they are arranged to attach the latter to the fixed support 18. For the purposes of illustration, the construction of the magazine and of the feeding means is such as to provide for the feeding of three sections or sheets of material at one time. It is apparent, however, that the mechanism may be readily adapted to the feeding of the sheets in sets of any desired number. Slidably supported on the table 12 is the sheet feeding member 36 having formed therein an opening or pocket 38 corresponding in shape and in size with the sections or sheets of material. Operating mechanism is provided for moving the feeding member so as to position the pocket 38 alternately under the magazine to receive a set of sections or sheets of material and to place the set of sheets in proper position over the die for the cutting operation, said operating means comprising, for the purposes of illustration, a rack 40 on the feeding member arranged in mesh with a gear 42 on a counter shaft 44 mounted in a bearing 46 on the frame of the machine, said shaft carrying at its opposite end a second gear 48 arranged in constant mesh with a segmental rack 50 at the lower end of a lever 52 pivoted at 54 on the machine frame. Pivoted mounted at the upper end of the lever 52 is a roller 56 held in constant engagement with a cam 58 on the main shaft 24. The roll and cam may be maintained in said engagement by any well-known means, a spring-pressed plunger 60 being provided in the present instance and arranged to engage said lever 52 near the lower end thereof and being urged in a direction to effect said engagement by means of a spring 62 mounted in a seat in the extension 14 of the machine frame. The operation of the feeding means, and especially with relation to the reciprocations of the plunger, will be evident from inspection of Fig. 1 of the drawings, it being obvious that the feeding member or transfer for the sheet material must remain at rest during the working stroke of the plunger and must then move to procure another set of sections or sheet material after the plunger has been carried upwardly out of the opening or pocket 38. This timing of the plunger operating mechanism and of the feed mechanism is secured through the shape of the cam 58 and its position relatively to the bell-crank 22 on the same shaft. As disclosed in Fig. 1, the cam 58 is provided with a concentric portion for engaging and holding the lever 52 in such a position that the feed member connected with and operated from said lever is held with the pocket therein in proper alignment with the plunger during reciprocation thereof to effect the dieing out operation. Then, as the plunger rises, a low portion on the cam 58 is presented to the roller 56 and the lever 52 is operated upon by the spring-pressed plunger 60 to effect a feed movement of the member 36 in a direction to place the pocket 38 beneath the magazine to receive a fresh set of sections of sheet material. As illustrated, the pocket 38 in the feed member is of a depth sufficient to receive a set of three sheets of material to present them to the cutting means, though as stated the construction of the feeding member may be varied to receive and feed the sheet of material in any number considered most desirable. A feature of importance in the operation of the plunger consists in so mounting and operating the same that it stops short of contact with the upper cutting edge of the die, and thus there is no dulling of the die nor injury to the cutting block and...
moreover, each sheet of material is made to serve as a cutting block for the sheet previously cut and to afford a smooth surface upon which each succeeding set of sheets may be fed with the greatest ease and without danger of injury thereto by the sharp edge of the die and without any special provision otherwise for supporting the sheets in the pocket of the feeding member as the pocket passes into vertical alignment with the die. See in this connection Fig. 3 of the drawings.

The mechanism for insuring the proper removal of the scrap or waste material from the field of cutting operations comprises, in the illustrative machine, a blade 61 formed integral with or securely attached to the breast surface of the die 6, and a second blade 66 similarly secured to the convex surface of the die substantially in alignment with the first-mentioned blade. Obviously, as the cutting edges of the blades are located practically in the plane of the cutting edge of the die, the scrap or waste material will be severed, as indicated in Fig. 4, in such a way as to permit the scrap to fall on each side of the die, means being provided in the form of double inclined surfaces having the function of deflecting the scrap in opposite directions clear of the die and of the machine. In the construction shown, inclined surfaces 68 are formed on a part of the frame 10 which furnishes a support for the die 6. As a matter of convenience, the inclined surfaces for deflecting the scrap material might be provided by separate and distinct members inclined, as shown, laterally of each other and also downwardly to one side for the purpose of directing the scrap material to one side of the machine. Since the scrap is disposed of simultaneously with the cutting of each sheet, it is clear that a theoretically unlimited number of sheets may be continuously moved toward the cutting edge of the die and be successively cut into blanks as they reach the said cutting edge. Under certain conditions it may be desirable to construct the machine without a feeding mechanism and with the cutting block and die relatively movable through a much greater distance than that indicated in the illustrative machine. With such a machine, the operative might place a dozen or two dozen or any convenient number of sheets in line with the cutting edge of the die and then cause relative movement of die and cutting block to effect a continuous cutting operation of all the sheets in the stack. Since each sheet is cut and the scrap thereof removed at the same time, the machine is not necessarily supplied with any more power than that provided for a machine which operates to cut only one sheet at each reciprocation of the die or cutting block.

A convenient arrangement for collecting the blanks or heel lifts comprises a magazine section 70, preferably of the shape of the heel lift or other blank being manufactured by the machine and detachable so that it may be readily placed in position to receive the blanks and removed from such position to be emptied or to permit the substitution of an empty magazine. While any well-known means may be used for holding this magazine 70 in position beneath the die, that disclosed comprises spring clips 72 fixedly secured to the machine frame and adapted to clasp the magazine and hold it detachably in proper position. Preferably, the magazine for the blanks is constructed of sheet material, preferably metal possessing the required degree of resiliency and bent into the shape approximately of the blank with which it is designed to be used as a collecting magazine, the construction preferably being such that the sides of the magazine normally press upon the edges of the blanks contained therein to hold them within the magazine without the necessity of any other support for the blanks. In this condition the magazine with its contents may be readily removed from the blank producing machine and placed in any other machine designed to perform further operations on the blank. When placed in the blank producing machine or in any other machine, the sides of the magazine are pressed apart by means provided for the purpose in order that blanks may readily enter or leave the magazine. In the illustrated construction the means for thus controlling the sides of the magazine consists of a number of simply constructed toggles of which one is shown at 74 in Fig. 1 of the drawings. The ends of the toggle are loosely received in slots in outturned flanges 75 at the sides of the magazine, shoulders 77 on the toggle contacting with the inner surfaces of the flanges to press the sides apart during the time that the blanks are entering the magazine. Before removing the magazine from the clips 72, the toggles are broken to permit the sides of the magazine to grip the blanks along their edges to hold them within the magazine.

It is thought that the operation of the machine will be apparent from the foregoing description. Attention should be called to the fact, however, that in starting operations with the machine, a set of sections or sheets of material should be introduced into the pocket 38 by hand for the operation of the plunger in the first cutting operation. There is thus afforded a supporting surface consisting of the partially cut sheet 79 (Fig. 3) upon which the succeeding set of sheets can be fed, subsequent operations of the plunger and die always leaving a sheet corresponding to sheet 79 for the purpose of
supporting each succeeding set of sheets in proper position for the cutting operation. Obviously, all that is necessary thereafter is that the magazine 26 be kept filled with sections of sheet material, the machine operating to cut the sections into the blanks and to eject the scrap or waste material without further attention on the part of the attendant. Because of the simplicity of operation of the machine and the efficiency in the arrangements for collecting the heel lifts or other manufactured article and disposing of the scrap or waste material, an attendant may readily take care of a large number of these machines.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a cutting machine, means for cutting blanks from sheet material, and means for insuring the removal of scrap material surrounding the cutting means simultaneously with the cutting of each blank.

2. In a cutting machine, means for cutting blanks from sheet material, and means comprising stationary cutting means, for insuring the removal of scrap material from contact with the first-mentioned cutting means on all sides thereof simultaneously with the blank cutting operation.

3. In a cutting machine, cutting means comprising a die and a block relatively reciprocable to effect cutting operations on sheet material, and means for insuring the removal of scrap material from contact with the die simultaneously with each cutting operation.

4. In a cutting machine, cutting means comprising relatively reciprocable cutting block and die members constructed and arranged to cut progressively through a plurality of superimposed sheets to form blanks therefrom and to insure the removal of scrap material from contact with the die member progressively with the cutting of the blanks.

5. In a cutting machine, means for cutting blanks from sheet material comprising a cutting block, and means comprising a die relatively reciprocable with respect to said block to effect cutting operations, the construction and arrangement being such that scrap material is discharged freely downwardly on two sides of the die as the sheet material is forced downwardly on the die.

6. Means for cutting blanks from sheet material comprising a hollow die, a cutting block for forcing a plurality of blanks successively into and through said die, and blades at opposite sides of the die for cutting the scrap in pieces to free the die from contact with the scrap simultaneously with the dieing out of each blank.

7. In a cutting machine, means for cutting successively a plurality of blanks from a stack of superimposed sheets during movement of the stack relatively to the cutting means, and means for insuring the removal from the cutting means of the scrap of each sheet simultaneously with the cutting operation on the sheet.

8. In a cutting machine, a hollow die, a plunger for forcing a plurality of superimposed sheets toward and against the cutting edge of the die to effect the cutting of blanks which pass through the die, and means for cutting the scrap material simultaneously with the progressive cutting of the sheets by the die to free the die from the scrap material of each sheet as it is cut, whereby an unlimited number of sheets may be progressively cut by the co-operation of the die and the cutting means.

9. In a cutting machine, cutting means comprising a die, a cutting block, feeding means comprising a member having a pocket therein constructed and arranged to hold a plurality of sheets in position for the cutting operation, and a magazine cooperating with said member to supply said sheets of material to the cutting means.

10. In a cutting machine, a die, means for simultaneously feeding a plurality of sheets into position over the die means for cutting scrap material, and means for progressively moving the superimposed sheets against the cutting edge of the die and against the means for cutting the scrap material and forcing the scrap material downwardly progressively with the dieing-out of the blanks so as to insure removal of the scrap from the machine.

11. In a cutting machine, a die for cutting a plurality of sheets fed simultaneously into position above the die, a plunger arranged to operate in such a way as to force all of the sheets except the topmost into and over the die, the topmost sheet being only partially cut through and resting on the cutting edge of the die, thus serving as a supporting surface for another set of sheets as they are fed into cutting position over the cutting edge of the die, and means for successively feeding sets of sheets into cutting position above the die.

12. A method of cutting blanks from sheet material comprising cutting sheet material into sections approximating closely in size the size of the blanks to be cut therefrom, placing a plurality of the sections in stacked relation in line with the cutting edge of a hollow die, forcing all of the sections simultaneously toward and progressively upon the cutting edge of the die, and progressively cutting the scrap, whereby blanks are cut from sheet material as a continuous operation.

13. A method of cutting blanks from sheet material comprising placing a plurality of stacked sheets in line with the cut-
ting edge of a hollow die, continuously moving all of the sheets and the die relatively to each other so as to force the sheets progressively upon the cutting edge of the die, and simultaneously with the dieing-out of each blank cutting the scrap, whereby a theoretically unlimited number of sheets may be progressively forced through the die to have blanks cut therefrom.

14. A magazine for blanks constructed of resilient sheet material formed to correspond substantially to the shape of the blank to be contained therein and designed to grip the blanks placed therein, in combination with means for causing the magazine to release the blanks within and to permit the insertion or withdrawal of blanks with respect to the magazine.

15. A magazine for blanks comprising a container of resilient sheet material shaped in cross section substantially to the shape of the blank to be contained thereby and having a partially open side so that the edges thereof are spaced apart, the construction of the container being such as to press normally upon the blanks contained therein to retain them in position in the container, and means for causing the container to release the blanks.

16. A magazine for blanks comprising a container of resilient sheet material formed to correspond approximately to the shape of the blanks to be contained therein and having one side partially open so that the edges of the container are spaced from each other, the construction of the container being such that it normally presses upon the blanks contained therein to retain them in the container, and a toggle for spreading the sides of the container and holding them spread apart to release the blanks in the container.

17. In a cutting machine, means for cutting blanks from sheet material comprising a hollow die supported so that the waste material may drop freely on each side of the die, blades secured to the die at opposite sides thereof for severing the material in contact with the outer surface of the die at the same time the blank cut from said material passes into the die, and means comprising a block for moving the sheet material toward and against the cutting edges of the die and blades and for forcing the blanks into the die and the severed scrap material downwardly past the blades so that the scrap drops freely away from the die.

18. In a cutting machine, cutting means comprising a die and a cutting block, feeding means comprising a member having a pocket therein constructed and arranged to receive sheet material and hold it in position for the cutting operation, and means for moving the member alternately into and out of position between the die and cutting block.

19. In a machine of the character described, cutting means comprising a die and a cutting block, a magazine for holding sheet material in superposed layers, means for transferring sheet material from the magazine to cutting position, comprising a member having a pocket therein of a size to receive the sheet material from the magazine and movable from receiving position in alignment with the magazine to a position in which the material is held by the pocket against lateral displacement during a cutting operation, and means for moving the cutting block into the pocket to force the material on the die.

20. In a machine of the character described, cutting means, a magazine for holding sheet material in superposed layers, means movable from a position in alignment with the magazine to a position in alignment with the cutting means for transferring sheet material from the magazine to cutting position and for keeping it under control during a cutting operation, and means for operating the cutting means to cut the material and to remove it from the transferring means.

21. A magazine for blanks constructed of resilient sheet material and designed to grip the blanks placed therein, in combination with readily operable means for spreading the sides of the magazine to release the blanks within or to permit of the introduction of blanks into the magazine.

22. In a cutting machine, relatively movable die and cutting block members for cutting blanks from sheet material, a magazine for the material, and a feeder having a pocket therein for receiving sheet material from the magazine and moving it to cutting position, one of said members being movable through the pocket to effect the cutting operation and at the same time withdraw the material from the pocket.

23. In a cutting machine, die and cutting block members relatively movable toward and from each other in cutting operations upon sheet material in combination with a member having a pocket therein for holding the material during cutting thereof, one of the members being movable into the pocket to effect cutting of the material and the removal of the material from the pocket.

24. In a cutting machine, die and cutting block members relatively movable toward and from each other in cutting operations upon sheet material in combination with means providing a pocket for holding the material during cutting thereof, one of the members being movable into the pocket to effect cutting of the material and the removal of the material from the pocket.

In testimony whereof I have signed my name to this specification.

FREDERICK M. FURBER,